REMARKS

Claims 1-13 and 18-36, 41 and 46-53 remain in the application.

Applicants have cancelled claims 37-40 and 42-45.

1. Claim Objections:

Claims 43-53are objected to because of certain informalities. In particular the Examiner asserts that the "status of the claims are wrong".

Applicants assert that only claims 43-45 are designated with the incorrect status (New) while claims 46-53 are designated with the correct "Previously added" status. Applicants have cancelled claims 43-45 and as such informality asserted by the Examiner has been rendered moot.

Based on the above, Applicant respectfully requests that the claim objections should be withdrawn.

2. §103 Rejections

Claims 1-13, 18-36, 41 and 46-53 have been rejected under 35 USC §103 (a) as being over Seiji ((JP 540066152).

Claims 1-13, 18-36, 41 and 46-53 have each been previously amended (either directly or via amendment to the independent claim from which it depends) to include the limitation of "a lens member which is "integrally attached to and extends from the end of the optical waveguide". In the Applicants previous 2/07/06 response/amendment it was argued that the lens disclosed in Seiji does not include, teach, or suggest a "lens member which is integrally attached to and extends from the end of the optical waveguide. However, in the instant PTO communication, the Examiner has asserted that "It would have been obvious to one of ordinary skill in the art ... to make the lens integral with the waveguide and the lens member ...". The Applicants respectfully disagree with this assertion.

In particular, the Applicants assert that the disclosure included in the Seiji reference clearly teaches away from the concept of integrally attaching the lens member

to the optical waveguide. It is well settled law that "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553. Gurley further asserts that if a prior art reference "suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant" that reference is said to "teach away" from the claimed invention.

Seiji is clearly directed at curing the prior art problem of the inability or difficulty of "adjusting the direction of the parallel beam and adjusting the position of optical fiber in order to orient the parallel beam to a predetermined direction". To solve that problem Seiji discloses a means/device, including a block and an adjusting jig, which enables the "adjustment of the angle of the spherical lens with respect to luminous flux reference plane according to adjusting jig" thus resulting in a device configuration where, "the incident light according to optical fiber and the exit light from the spherical lens can be adjusted to be parallel to each other; see page 3, lines 14-17 of the translated reference included herein. In fact, the Applicants would like to point out that there are at least 10+ references to the concept of adjustment/adjustable/adjusting jig in the Seiji reference; translated copy of Seiji reference attached hereto as Appendix I. That being said, one reading Seiji and the idea of a configuration which is directed at easy adjustment so as to cure the prior art problem of a lack of easy adjustment, would not be motivated to invent an integral lens member/waveguide device. To the contrary, the Applicants upon reading Seiji would be led in a direction divergent ("adjustable configuration") from the path that was taken by the Applicants ("integral configuration"); a lens/waveguide configuration that is integral is not capable of easy adjustment. In short, Seiji teaches away from an integral lens member/waveguide configuration.

As discussed above, the lens disclosed in Seiji does not include a "lens member which is integrally attached to and extends from the end of the optical waveguide" and in fact teaches away from this "integral" concept.. The above being said the Applicants thus assert that, claims 1-13, 18-36, 41 and 46-53 are patentable over the Seiji reference. Withdrawal of the rejection of claims 1-13, 18-36, 41 and 46-53 is respectfully requested.

Claims 37-38, and claims 39-40 have been rejected under 35 USC §103 (a) as being as being unpatentable over Lebduska (4078852).

Applicants have cancelled Claims 37-38 and 39-40 and thus the 35 USC §103 (a) rejection asserted by the Examiner has been rendered moot. Withdrawal of the rejection of claims 37-38 is respectfully requested.

Claims 42-45 have been rejected under 35 USC §103 (a) as being unpatentable over Konno (5293438) in view of Lynch (4844580).

Applicants have cancelled claims 42-45 and thus the 103 (a) rejection asserted by the Examiner has been rendered moot. Withdrawal of the rejection of claims 37-38 is respectfully requested.

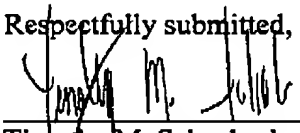
3. Conclusion

Claims 1-13 and 18-36, 41 and 46-53 are believed allowable over the art of record for the reasons discussed above, and reconsideration of those claims is respectfully requested

Based upon the above amendments, remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Please direct any questions or comments to Timothy M. Schaeberle at (607) 974-3164.

Respectfully submitted,



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APPENDIX I

(19) JAPANESE PATENT OFFICE (JP)
(12) PATENT JOURNAL (A)
(11) KOKAI PATENT APPLICATION NO. SHO 54[1979]-66152

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(51) Int. Cl.[2]: G 02 B 5/14
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No. of Inventions: 1 (Total of 3 pages)
Examination Request: Not requested
(54) LENS TERMINAL FOR OPTICAL TRANSMISSION
(21) Application No.: Sho 52[1977]-132170
(22) Application Date: November 5, 1977
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[There are no amendments to this patent.]

CLAIMS

1. A lens terminal for optical transmission, characterized by the fact that in a lens system for optical communication, which uses a spherical lens for making a connection between optical fibers or between an optical fiber and another [form of] optical transmission system, a spherical lens having one plane cut so as to include the spherical core on the lens side was used, with an optical block being attached to this cut plane.

2. The lens terminal for optical transmission according to Claim 1, characterized by the fact that the aforementioned spherical lens is made adjustable so that the incident light and the exit light of the aforementioned spherical lens are made parallel with respect to a peripheral apparatus attached to the aforementioned spherical lens or an optional reference plane.

DETAILED EXPLANATION OF THE INVENTION

The present invention relates to a lens terminal for optical transmission. More specifically, it relates to a terminal in a lens system for making a connection between optical fibers or an optical fiber and another optical transmission system in optical fiber communication.

The need to make a connection between an optical fiber and an optical fiber or between an optical fiber and another optical transmission system in optical fiber communication, which has developed at a rapid pace in the recent years, is the same as in the case of other communications. As is already known about connecting optical fibers, optical fibers are very thin with a diameter of, for example, 60 microns; moreover, the light that is transmitted through the optical fibers diffuses at a considerable [broad] angle when it exits into the air, hence it was difficult to connect optical fibers without the loss of light.

In connecting optical fibers, the use of a microscopic component or focusing the diffused light that exited the optical fiber with a lens, and connecting to other optical fibers, can be considered. The method of focusing the diffused light that exited from the optical fiber with a lens can be easily realized in comparison to the method that uses a microscopic component, hence it is a method that conventionally was used widely. However, the diameter of the optical fiber is narrow, hence adjustment for transmitting light without a loss of light is troublesome.

Therefore, a lens terminal for optical transmission like what is shown in Figure 1 was conventionally used. This was a method of cutting a round rod lens (2) like in Figure 1(b) from sphere (1) in Figure 1(a), providing reference plane (3), and causing the light from optical fiber (4) to become parallel beam (5) using round rod lens (2). However, in this method, it is not possible to adjust the direction of the parallel beam (5), and adjusting in the position of optical fiber (4) in order to orient parallel beam (5) to a predetermined direction was troublesome.

The purpose of the present invention is to provide a lens terminal for optical transmission, which has a simple structure, can make the adjustment easily, and can be realized at a low cost.

According to the present invention, a lens terminal for optical transmission is provided characterized by the fact that in a lens system for optical communication, which uses a spherical lens to make a connection between optical fibers or between an optical fiber and another optical transmission system, a spherical lens having one plane cut to include the spherical core on the lens side was used, with an optical block being attached to this cut plane.

Furthermore, according to the present invention, a lens terminal for optical transmission according to Claim 1 is provided, characterized by the fact that the aforementioned spherical lens was made adjustable so that the incident light and the exit light of the aforementioned spherical

lens are made parallel with respect to a peripheral apparatus attached to the aforementioned spherical lens or an optional reference plane.

Below, application examples of the lens terminal for optical transmission related to the present invention will be explained in detail according to figures.

Figure 2 is the first application example of a spherical lens used in the lens terminal related to the present invention. In this figure, (10) is the spherical core of spherical lens (11), (12) is the glass block, and (13) is the optical fiber, with position (A) where optical fiber (13) and glass block (12) make contact being selected to approximately be the focal point position of spherical lens (11). Spherical lens (11) is fabricated by cutting one plane so as to include spherical core (10) on the lens side as shown in the figure.

Figure 3 shows the state of attachment of a block comprised of spherical lens (11) and glass block (12), shown in Figure 2, to peripheral apparatus (14). In Figure 3, (15) is the luminous flux reference plane and (16) is the adjusting jig. Also, spherical lens (11) and peripheral apparatus maintain contact at a high precision at point (B), and by adjusting the angle of spherical lens (11) with respect to luminous flux reference pane (15) according to adjusting jig (16), the incident light according to optical fiber (13) and the exit light from spherical lens (11) can be adjusted to be parallel to each other.

Figures 4(A) and (B) show an application example for the case in which the lens terminal related to the present invention and a light-emitting or a light-receiving element (18) are combined. As shown in Figures 4 (A) and (B), the luminous flux that was adjusted to be parallel to luminous flux reference plane (15) of peripheral apparatus (14) by regulating adjusting jig (16) can be made to be incident or to exit.

Figures 5(A) and (B) show a modified example of aforementioned Figure 3 for the case in which the lens terminal related to the present invention and an optical fiber are combined. In Figure 5(A), spherical lens (11) is adjusted directly with adjusting jig (16) without using optical fiber block (12); in Figure 5(B), auxiliary part (21) is fixed to optical fiber block (12), optical fiber (13) is attached to this auxiliary part (21), and auxiliary part (21) is adjusted with adjusting jig (16). By doing so, the same effects as shown in Figure 3 are obtained.

Figure 6 shows an example of the adjusting jig and shows an example of the case in which fine adjustment is made possible by applying a taper at the extreme end of adjusting machine screw (16). However, the adjusting jig is not restricted in this application example in the present invention.

As was explained in detail above, an inexpensive method capable of easily making adjustments so that the luminous flux that is incident or exits in parallel in coordination with the luminous flux reference plane of the peripheral apparatus can be conformed favorably with an

external optical circuit such as an optical fiber, an optical element, and the like provided according to the present invention.

Also, fabrication and adjustment can be made easily even when the number of spherical lenses is minimized so the effect of the present invention is considerable.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is an example of a conventional lens terminal for optical transmission, Figure 2 is a diagram explaining the combination of the optical block and the spherical lens of the lens terminal related to the present invention, Figure 3 is an application example for a case in which an optical fiber and the lens terminal related to the present invention are combined, Figure 4 is example for a case in which the lens terminal related to the present invention is combined with a light emitting or a light receiving element, Figure 5 is another application example of the case shown in Figure 3, and Figure 6 is an example of the adjusting jig for the lens terminal related to the present invention.

In the figures, (11) is the spherical lens, (12) is the optical block, (13) is the optical fiber, (14) is the peripheral apparatus, (15) is the luminous flux reference plane, (16) is the adjusting jig, and (17) represents the luminous flux adjusted to be parallel to the luminous flux reference plane.

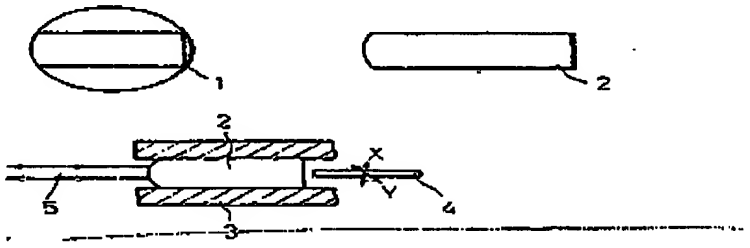

Figure 1

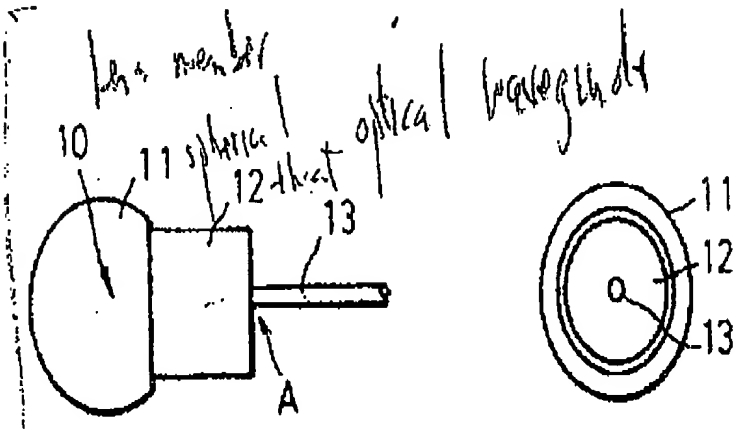

Figure 2

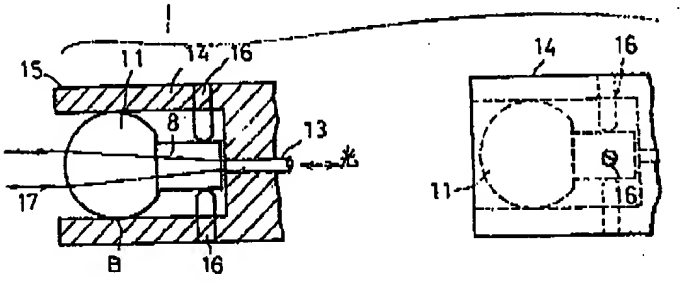

Figure 3

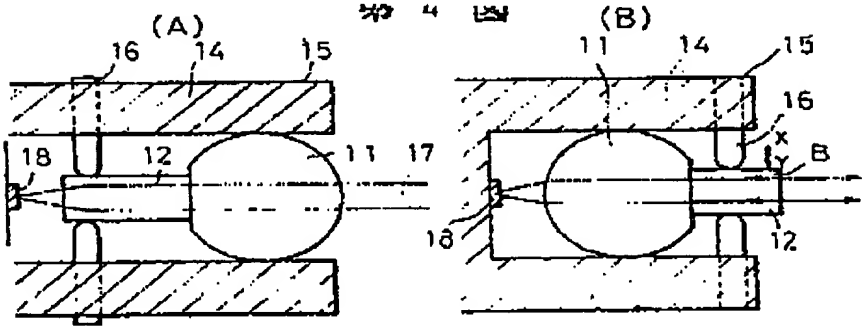

Figure 4

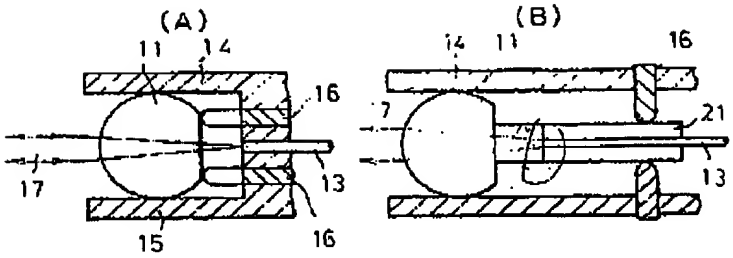

Figure 5

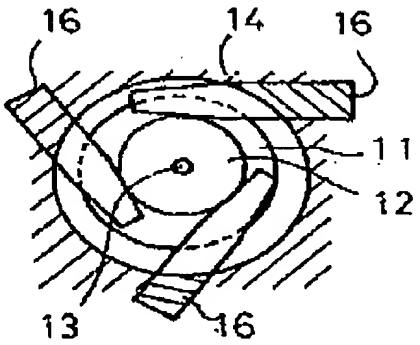

Figure 6

KOKAI PATENT APPLICATION NO. Sho 54[1979]-66152
LENS TERMINAL FOR OPTICAL TRANSMISSION

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